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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/751,215	12/29/2000	Andrew Yeoh	042390.P10048	8879

7590

12/18/2002

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EXAMINER

VU, HUNG K

ART UNIT

PAPER NUMBER

2811

DATE MAILED: 12/18/2002

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

09/751,215

Applicant(s)

YEOH, ANDREW

Examiner

Hung K. Vu

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --
Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 05 September 2002.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-7, 21 and 28 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-7, 18-21 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on _____ is: a) ☐ approved b) ☐ disapproved by the Examiner.
If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

- 13) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
* See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) _____
- 4) ☐ Interview Summary (PTO-413) Paper No(s). _____
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: _____

DETAILED ACTION

Claim Rejections - 35 USC § 102

1. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(e) the invention was described in-

(1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effect under this subsection of a national application published under section 122(b) only if the international application designating the United States was published under Article 21(2)(a) of such treaty in the English language; or

(2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that a patent shall not be deemed filed in the United States for the purposes of this subsection based on the filing of an international application filed under the treaty defined in section 351(a).

Claims 1 and 2 are rejected under 35 U.S.C. 102(e) as being anticipated by Pramanick et al. (PN 6,117,770, of record).

Pramanick et al. discloses, as shown in Figures 2-4, a method for forming hardened interconnects comprising,

depositing a metal layer (101) over a semiconductor wafer surface (200);

introducing additional metal species (206) into the metal layer;

performing chemical-mechanical polishing of the deposited metal layer. Note that

Pramanick et al. teaches introducing additional metal species into the metal layer, therefore, it is inherent that the additional metal species hardens the deposited metal layer to reduce the rate of the polishing.

With regard to claim 2, Pramanick et al. discloses the deposited metal layer is copper.

Claim Rejections - 35 USC § 103

2. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 3-4 and 7 are rejected under 35 U.S.C. 103(a) as being unpatentable over Pramanick et al. (PN 6,117,770, of record) in view of Akutsu et al. (PN 4,749,584, of record). Pramanick et al. discloses the additional metal species is tin or magnesium. Pramanick et al. does not disclose the additional metal species is beryllium. However, Akutsu et al. discloses the additional metal species in the metal layer is tin, magnesium, or beryllium. Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to using beryllium as the additional metal species in the metal layer because beryllium, tin, and magnesium are commonly used as the alloys and they are interchangeable.

With regard to claim 4, it is inherent that the beryllium will form a solid solution in the deposited copper layer.

3. Claims 5 and 6 are rejected under 35 U.S.C. 103(a) as being unpatentable over Pramanick et al. (PN 6,117,770, of record).

With regard to claim 5, Pramanick et al. discloses all of the claimed limitations except the steps of heating the metal film with the introduced metal species, allowing the heated metal film to

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cool, then performing the chemical-mechanical polishing. However, it would have been obvious to one of ordinary skill in the art at the time the invention was made to form the metal layer of Pramanick et al. including the steps of heating the metal film with the introduced metal species, allowing the heated metal film to cool, then performing the chemical-mechanical polishing because it is conventional to heat the deposited metal layer to activate the metal species into the metal layer, and to allow it to cool down so the polishing would be reduced.

With regard to claim 6, Pramanick et al. discloses the deposited metal layer is copper.

4. Claims 18-19 and 21 are rejected under 35 U.S.C. 103(a) as being unpatentable over Nogami et al. (PN 6,022,808) in view of Pramanick et al. (PN 6,117,770, of record).

Nogami et al. discloses, as shown in Figures 1-3, a method of forming interconnects of an integrated circuit comprising,

forming an opening in an insulating film (10);

depositing a metal film (13) over the insulating layer and in the opening and filling the opening with the metal film;

introducing an additional metal species into the metal film in the opening and into the metal film over the insulating layer;

after introducing the additional metal species, chemical mechanical polishing the deposited metal film with the additional metal species to remove the metal film from over the insulating layer.

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Nogami et al. discloses all of the claimed limitations except the insulating film formed over a substrate. However, Pramanick et al. disclose forming an opening in an insulating film (202) formed over a substrate (200). Note Figures 2-4 of Pramanick et al.. Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to form the insulating layer of Nogami et al. over a substrate, such as taught by Pramanick et al. because it is conventional to form the substrate used as a base layer for form other subsequent layers on the base layer.

With regard to claim 19, Nogami et al. and Pramanick et al. disclose the metal film comprises copper.

With regard to claim 21, Nogami et al. and Pramanick et al. disclose the method further comprising heating the deposited metal film with the introduced metal species prior to performing the chemical mechanical polishing.

5. Claim 20 is rejected under 35 U.S.C. 103(a) as being unpatentable over Nogami et al. (PN 6,022,808) in view of Pramanick et al. (PN 6,117,770, of record) and further in view of Akutsu et al. (PN 4,749,584, of record).

Nogami et al. and Pramanick et al. disclose the additional metal species is tin or magnesium. Nogami et al. and Pramanick et al. do not disclose the additional metal species is beryllium. However, Akutsu et al. discloses the additional metal species in the metal layer is tin, magnesium, or beryllium. Therefore, it would have been obvious to one of ordinary skill in the

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art at the time the invention was made to form interconnects of Nogami et al. and Pramanick et al. using beryllium as the additional metal species in the metal layer, such as taught by Akutsu because beryllium, tin, and magnesium are commonly used as the alloys and they are interchangeable.

Response to Arguments

6. Applicant's arguments filed 09/05/02 have been fully considered but they are not persuasive.

It is argued, at pages 5-6 of the Remarks, that Pramanick et al. fails to teach introducing additional metal species prior to performing chemical mechanical polishing of the metal film. In response to applicant's argument that the references fail to show certain features of applicant's invention, it is noted that the features upon which applicant relies (i.e., prior) are not recited in the rejected claim(s). Although the claims are interpreted in light of the specification, limitations from the specification are not read into the claims. See *In re Van Geuns*, 988 F.2d 1181, 26 USPQ2d 1057 (Fed. Cir. 1993). In fact, Pramanick et al. teaches, as shown in Figures 3-4 and Col. 5, lines 35-37, introducing additional metal species prior to performing chemical mechanical polishing of the metal film.

It is argued, at page 6 of the Remarks, that Pramanick et al. does not teach heating the deposited metal with the introduced metal species prior to chemical mechanical polishing of the metal film. This argument is not convincing because it is conventional to heat the deposited metal with the introduced metal species prior to chemical mechanical polishing of the metal film to activate the

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metal species into the metal layer. Note Nogami et al. (PN 6,022,808) is cited to support the well-known position.

Conclusion

7. **THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire **THREE MONTHS** from the mailing date of this action. In the event a first reply is filed within **TWO MONTHS** of the mailing date of this final action and the advisory action is not mailed until after the end of the **THREE-MONTH** shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than **SIX MONTHS** from the mailing date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Hung K. Vu whose telephone number is (703) 308-4079. The examiner can normally be reached on Mon-Thurs 7:00-4:30 and every other Friday 7:00-3:30, Eastern Time.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Tom Thomas can be reached on (703) 308-2772. The fax phone numbers for the organization where this application or proceeding is assigned are (703) 308-7722 for regular communications and (703) 308-7722 for After Final communications.

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Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703) 308-0956.

$$V_u$$

December 9, 2002

Long Term

THOMAS
EXAMINER
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